

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Docket No: Q81612

Hisayuki MIKI, et al

Appln. No.: National Stage of PCT/JP2005/009008

Confirmation No.: Unknown

Group Art Unit: Unknown

Filed: July 13, 2006

Examiner: Unknown

For: P-TYPE GROUP III NITRIDE SEMICONDUCTOR AND PRODUCTION METHOD
THEREOF

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§ 1.97 and 1.98

MAIL STOP AMENDMENT

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

In accordance with the duty of disclosure under 37 C.F.R. § 1.56, Applicant hereby notifies the U.S. Patent and Trademark Office of the documents which are listed on the attached PTO/SB/08 A & B (modified) form and/or listed herein and which the Examiner may deem material to patentability of the claims of the above-identified application.

One copy of each of the listed documents is submitted herewith, except for the following: U.S. patents and/or U.S. patent publications; and co-pending non-provisional U.S. applications filed after June 30, 2003.

The present Information Disclosure Statement is being filed: (1) No later than three months from the application's filing date; (2) Before the mailing date of the first Office Action on the merits (whichever is later); or (3) Before the mailing date of the first Office Action after

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filing a request for continued examination (RCE) under §1.114, and therefore, no Statement under 37 C.F.R. § 1.97(e) or fee under 37 C.F.R. § 1.17(p) is required.

In compliance with the concise explanation requirement under 37 C.F.R. § 1.98(a)(3) for foreign language documents, Applicant encloses herewith a copy of a Communication from a foreign patent office in a counterpart application citing such documents (International Search Report for PCT/JP2005/009008 and Written Opinion of the International Searching Authority mailed August 23, 2005), together with an English-language version (if not already included) of at least that portion of the Communication indicating the degree of relevance found by the foreign patent office.

In compliance with the concise explanation requirement under 37 C.F.R. § 1.98(a)(3) for foreign language documents, Applicant submits the following explanations:

1. Regarding the present invention

An object of the present invention is to provide a method for producing a p-type Group III nitride semiconductor which can be used to produce a light-emitting device exhibiting low operation voltage and sufficiently high reverse voltage.

The inventors of the present invention found that when a p-type contact layer had a resistivity of 50 Ωcm to 2,000 Ωcm , the device operation voltage (V_f) was not greatly affected and a reverse voltage (V_r) was maintained at a high level, and that in order to obtain the resistivity, it was important that (1) a p-type dopant concentration in the p-type contact layer was 1×10^{18} to $1 \times 10^{21} \text{ cm}^{-3}$, (2) the hydrogen atom concentration in the p-type contact layer was higher than 1/5 the p-type dopant concentration and

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was lower than the p-type dopant concentration, and (3) the p-type contact layer was composed of AlGa_N. As a result, they accomplished the present invention.

2. Regarding JP 2001-102623 A (corresponding to US 6,365,923 B1) and JP 2001-119064 A listed in the IDS

These references disclose a p-type dopant concentration and a hydrogen atom concentration in the p-type contact layer, which are in the above range similar to the present invention. In these references, however, there are no descriptions or suggestions with regard to resistivity. Thus, there are no descriptions or suggestions with regard to an effect that when the resistivity is controlled within the range of 50 Ωcm to 2,000 Ωcm , a reverse voltage (V_r) is maintained at a high level, such as 20 V or more.

Further, in these references, only Ga_N is disclosed as a Group III nitride semiconductor composed of a p-type contact layer, and there are no descriptions or suggestions with regard to using AlGa_N as the p-type contact layer. In the case of a p-type contact layer composed of Ga_N, even if the p-type dopant concentration and the hydrogen atom concentration are in the above range, the resistivity is low and a high resistivity of 50 Ωcm to 2,000 Ωcm cannot be attained.

3. Regarding JP 2004-080047 A listed in the IDS

This reference specifies the resistivity of a p-type contact layer. However, the value is 40 Ωcm and there is no descriptions or suggestions with regard to the effect wherein, when the resistivity is controlled within the range of 50 Ωcm to 2,000 Ωcm , a reverse voltage (V_r) is maintained at a high level, such as 20 V or more.

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Also in this reference, there is no description or suggestion with regard to the p-type dopant concentration and the hydrogen atom concentration in a p-type contact layer.

4. Regarding other references listed in the Information Disclosure Statement

In these references, there is no description or suggestion with regard to the resistivity of a p-type contact layer and the hydrogen atom concentration therein. Thus, there is no description or suggestion with regard to the effect wherein, when the resistivity is controlled within the range of 50 Ωcm to 2,000 Ωcm , a reverse voltage (V_r) is maintained at a high level, such as 20 V or more.

Furthermore, JP 2001-119064 A and JP 10-084160 A correspond to U.S. 6,067,309. Also, JP 2003-243302 corresponds to WO 2003/068699, and JP 2002-057161 corresponds to EP 1 179 859.

The submission of the listed documents is not intended as an admission that any such document constitutes prior art against the claims of the present application. Applicant does not waive any right to take any action that would be appropriate to antedate or otherwise remove any listed document as a competent reference against the claims of the present application.

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AP20 Rec'd PCT/PTO 13 JUL 2006

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The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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Date: July 13, 2006

Substitute for Form 1449 A & B/PTO <u>INFORMATION DISCLOSURE</u> <u>STATEMENT BY APPLICANT</u> <i>(use as many sheets as necessary)</i>				<i>Complete if Known</i>	
				Application Number	National Stage of PCT/JP2005/009008
				Confirmation Number	Unknown
				Filing Date	July 13, 2006
				First Named Inventor	Hisayuki MIKI
				Art Unit	Unknown
				Examiner Name	
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U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. ¹	Document Number		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
		Number	Kind Code ² (if known)		
		US 2005/0042787	A1	02/24/2005	SHIGETOSHI ITO, ET AL
		US 6,365,923	B1	04/02/2002	HIDENORI KAMEI
		US 6,067,309	A	05/23/2000	MASAAKI ONOMURA, ET AL
		US			
		US			
		US			
		US			
		US			

FOREIGN PATENT DOCUMENTS							
Examiner Initials*	Cite No. ¹	Foreign Patent Document			Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Translation ⁶
		Country Code ³	Number ⁴	Kind Code ⁵ (if known)			
		JP	2003-243302	A	08/29/2003	SHOWA DENKO KK	Abstract
		WO	03/068699	A1	08/21/2003	SHOWA DENKO KK	
		JP	2004-96021	A	03/25/2004	SHOWA DENKO KK	Abstract
		JP	2003-133649	A	05/09/2003	SHARP CORP. SUMITOMO and ELECTRIC IND. LTD.	Abstract
		JP	2004-80047	A	03/11/2004	TOYODA GOSEI CO. LTD., TOYOTA CENTRAL RES. & DEV. LAB, and INCUNIV NAGOYA JAPAN SCIENCE & TECHNOLOGY AGENCY	Abstract
		JP	2002-57161	A	02/22/2002	SONY CORP	Abstract
		EP	1 179 859	A2	02/13/2002	SONY CORPORATION	
		JP	2001-102623	A	04/13/2001	MATSUSHITA ELECTRIC IND. CO. LTD.	Abstract
		JP	2001-119064	A	04/27/2001	MATSUSHITA ELECTRIC IND. CO. LTD.	Abstract
		JP	10-84160	A	03/31/1998	TOSHIBA CORP.	Abstract

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city, and/or country where published.	Translation ⁶

Examiner Signature	Date Considered
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ Applicant's unique citation designation number (optional). ² See Kind Codes of USPTO Patent Documents at www.uspto.gov, MPEP 901.04 or follow the hyperlink from the title of the document to the intranet. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST. 3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. ⁶ Applicant is to indicate here if English language Translation is attached.